

REMARKS

Prior to entry of the instant amendment, claims 20-31 are pending in the subject application. By the instant amendment, claims 32 and 33 are added. Claims 20 and 26 are independent.

Claims 20-33 are presented to the Examiner for further or initial prosecution on the merits.

A. Introduction

In the outstanding Office action, the Examiner rejected claim 31 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement; rejected claims 20-23 and 25-31 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,500,743 to Lopatin et al. (“the Lopatin et al. reference”) in view of U.S. Patent No. 6,316,297 to Matsuda (“the Matsuda reference”); rejected claim 24 under 35 U.S.C. § 103(a) as being unpatentable over the Lopatin et al. reference in view of the Matsuda reference as applied to claim 20 and further in view of U.S. Patent No. 6,891,235 to Furukawa et al. (“the Furukawa et al. reference”); and rejected claims 20-29 under 35 U.S.C. § 103(a) as being unpatentable over the Furukawa et al. reference in view of the Matsuda reference and the Lopatin et al. reference.

B. Asserted Rejection of Claim 31 Under 35 U.S.C. § 112, First Paragraph

In the outstanding Office action, the Examiner rejected claim 31 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. In particular, the Examiner asserted that “the second element extending from the first element laterally away from the T-shaped gate electrode does not fill the undercut region.” *Office action of April 20, 2006, at paragraph no. 2, page 2.* Applicants respectfully traverse this rejection.

As an initial matter, applicants note that claim 31 recites “wherein the surface insulating layer partially, but not completely, fills the undercut region and *the L-shaped lower*

spacer completely fills the remainder of the undercut region,” and does not recite “*the second element* completely fills the remainder of the undercut region.”

Furthermore, as illustrated in FIGS. 4 and 5 of the subject application, a lower insulating layer 170 is deposited to fill the undercut region of the gate pattern 140. That is, as stated in paragraph [0038] of the application as originally filed,

[0038] Thus, *the lower insulating layer 170 covers an entire surface of the surface insulating layer 150 and also fills the undercut region* of the gate pattern 140. In case the undercut region is narrow, the surface insulating layer 150 alone may fill the undercut region.

(*emphasis added*)

As illustrated in FIG. 6 of the subject application, the lower insulating layer 170 is further processed to form the L-shaped lower spacer 175. Therefore, applicants respectfully submit that FIGS. 4-6 clearly describe a surface insulating layer 155 that partially, but not completely, fills the undercut region, and an L-shaped lower spacer 175 that completely fills the remainder of the undercut region, as recited in claim 31. Accordingly, applicants respectfully submit that the application as originally filed describes the subject matter recited in claim 31. Therefore, applicants respectfully request that this rejection be reconsidered and withdrawn.

C. Asserted Obviousness Rejection of Claims 20-23 and 25-31

In the outstanding Office action, the Examiner rejected claims 20-23 and 25-31 under 35 U.S.C. § 103(a) as being unpatentable over the Lopatin et al. reference in view of the Matsuda reference. Applicants respectfully traverse this rejection, and respectfully submit that the Examiner failed to set forth a *prima facie* case of obviousness for at least the reasons set forth below.

Independent claims 20 and 26 recite, *inter alia*,

an L-shaped lower spacer . . . , the L-shaped lower spacer having a first element disposed substantially perpendicular to the semiconductor substrate, and having a second element disposed substantially parallel to the semiconductor substrate, the second element extending from the first element laterally away from the T-shaped gate electrode, wherein

the first element and the second element intersect to define a *substantially 90 degree angle in an outer surface of the L-shaped lower spacer*;

In the outstanding Office action, the Examiner asserted that the Lopatin et al. reference discloses,

an L-shaped lower spacer (124) covering a top surface of the semiconductor substrate at both sides of the T-shaped gate electrode (104, 2402, 1604) and covering sides of the wide portion of the T-shaped gate electrode (2402, 1604), the L-shaped lower spacer (124) having a first element disposed substantially perpendicular to the semiconductor substrate (102), and having a second element disposed substantially parallel to the semiconductor substrate, the second element extending from the first element laterally away from the T-shaped gate electrode (104, 2402, 1604), wherein the first element and the second element intersect to define a substantially 90 degree angle in an outer surface of the L-shaped lower spacer (124);

Office action of April 20, 2006, at paragraph no. 5, pages 3-4.

However, applicants respectfully submit that the spacer 124 in the Lopatin et al. reference is not L-shaped. For example, referring to FIG. 2 of the Lopatin et al. reference, a spacer 124 is disposed along the left side of a gate structure 104. As illustrated in FIG. 2, the spacer 124 is not L-shaped, but rather has a single, convex outer surface.

Moreover, referring to FIGS. 15 and 16 of the Lopatin et al. reference, a spacer 124 is disposed along a left side of a gate structure 104, and has an upper surface covered by features 1604 and 1602. As illustrated in FIGS. 15 and 16, the spacer 124 is not L-shaped, but rather is an upright rectangle having a single, vertical outer surface.

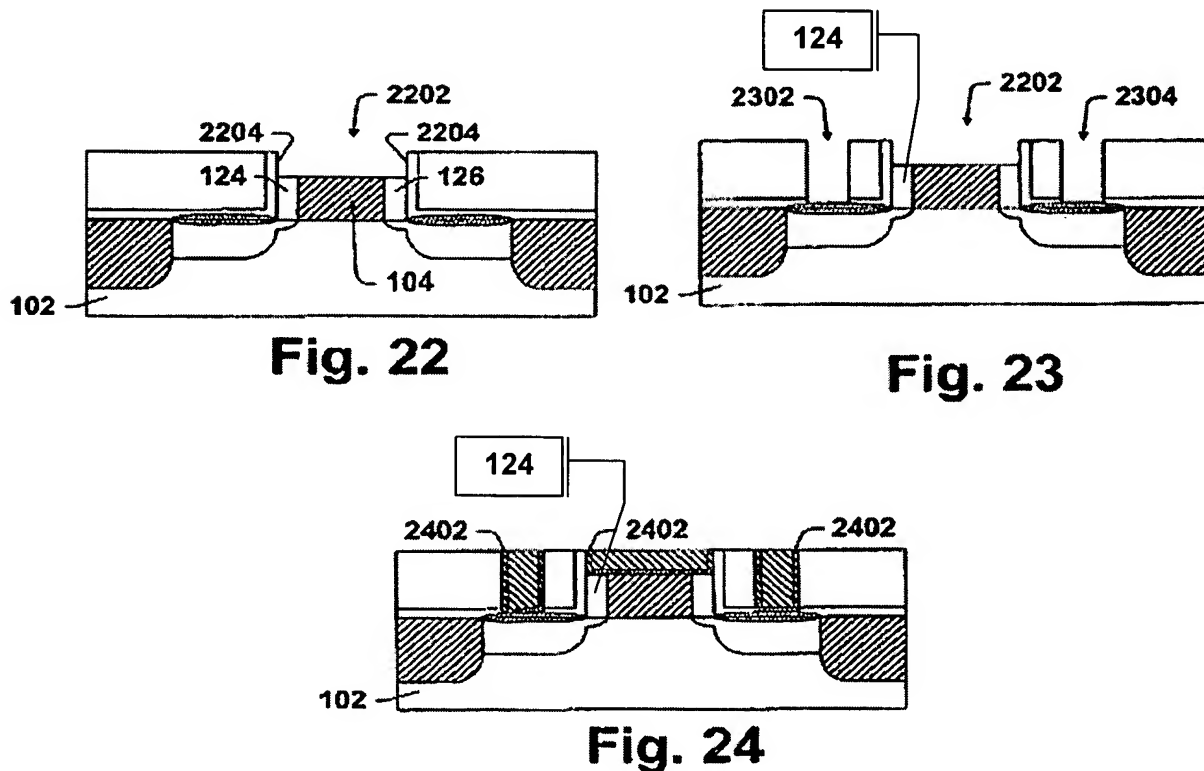
Additionally, referring to FIGS. 22-24 of the Lopatin et al. reference, a spacer 124 is disposed along a left side of a gate structure 104 and has an upper surface covered by feature 2402. As illustrated in FIGS. 22-24, the spacer 124 is not L-shaped, but rather is an upright rectangle having a single, vertical outer surface.

Applicants also note the Examiner's comments on page 10 of the outstanding Office action, which state,

Lopatin et al. discloses that it is conventional for the L-shaped lower spacer (124) with the first element and the second element intersect to define a substantially 90 degree angle in an outer surface (see fig. 24).

Office action of April 20, 2006, at paragraph no. 7, page 10.

Applicants respectfully disagree with this statement. As discussed above, FIG. 24 of the Lopatin et al. reference fails to disclose, or even suggest an L-shaped lower spacer having a first element and a second element that intersect to define a substantially 90 degree angle in an outer surface. Rather, the spacer 124 in FIG. 24 is rectangular. For reference, FIGS. 22-24 of the Lopatin et al. reference are reproduced below, with the spacer 124 additionally identified in FIGS. 23 and 24:



For at least the reasons set forth above, applicants respectfully submit that the Lopatin et al. reference fails to disclose, or even suggest, an L-shaped lower spacer as recited in independent claims 20 and 26. Further, the Matsuda reference similarly fails to disclose, or even suggest, an L-shaped lower spacer. Therefore, applicants respectfully submit that the proposed combination of the Lopatin et al. and Matsuda references fails to disclose or suggest

each and every element of claims 20 and 26. Accordingly, claims 20 and 26, as well as claims 21-23, 25 and 27-31 depending therefrom, are believed to be allowable, and applicants respectfully request that this rejection be reconsidered and withdrawn.

D. Asserted Obviousness Rejection of Claim 24

In the outstanding Office action, the Examiner rejected claim 24 under 35 U.S.C. § 103(a) as being unpatentable over the Lopatin et al. reference in view of the Matsuda reference as applied to claim 20 and further in view of the Furukawa et al. reference. Applicants respectfully traverse this rejection, and respectfully submit that the Examiner failed to set forth a *prima facie* case of obviousness for at least the reasons set forth below.

As set forth above in section C, applicants respectfully submit that the Lopatin et al. and Matsuda references fail to disclose or suggest an L-shaped lower spacer as recited in independent claim 20, from which claim 24 depends. Moreover, applicants respectfully submit that the Furukawa et al. reference similarly fails to disclose or suggest the claimed L-shaped lower spacer, as discussed below in section E. Therefore, applicants respectfully submit that claim 24 is allowable over the cited combination of the Lopatin et al., Matsuda, and Furukawa et al. references, and respectfully request that this rejection be reconsidered and withdrawn.

E. Asserted Obviousness Rejection of Claims 20-29

In the outstanding Office action, the Examiner rejected claims 20-29 under 35 U.S.C. § 103(a) as being unpatentable over the Furukawa et al. reference in view of the Matsuda reference and the Lopatin et al. reference. Applicants respectfully traverse this rejection, and respectfully submit that the Examiner failed to set forth a *prima facie* case of obviousness for at least the reasons set forth below.

In the Office action, the Examiner asserted that the Furukawa et al. reference discloses “an L-shaped lower spacer 48.” *Office action at paragraph no. 7, page 9.* However, the Examiner admitted that “Furukawa et al. fails to disclose wherein the first

element and the second element intersect to define a substantially 90 degree angle in an outer surface of the L-shaped lower spacer.” *Office action of April 20, 2006, at paragraph no. 7, page 10.* Instead, the Examiner asserted that it would have been obvious to modify the spacer 48 of the Furukawa et al. reference, stating,

... it would have been an obvious matter of design choice to form the L-shaped lower spacer with the 90 degree angle in an outer surface as applicant claimed, since such a modification would have involved a mere change in the size of a component. A change in size is generally recognized as being within the level of ordinary skill in the art. *In re Rose*, 105 USPQ 237 (CCPA 1995). [sic]

Office action of April 20, 2006, at page 10.

Applicants respectfully disagree. Applicants note that the L-shaped lower spacer recited in claim 20 is used during ion implantation to reduce energies of the implanted ions, whereby the horizontal projection diminishes the energies of ions passing therethrough to form a mid-concentration impurity region under the horizontal projection. *See the application as originally filed at, e.g., paragraph [0046].* Therefore, the shape of the L-shaped lower spacer recited in independent claims 20 and 26 is more than a mere change in form.

Further, *In re Rose* regarded a patent application for packaged lumber, and the court stated that a change in size of the lumber package is not ordinarily a matter of invention. Applicants respectfully submit that *In re Rose* is inapposite where, as here, the shape of the structure is directly related to its function, viz., reducing energies of implanted ions so as to yield an impurity region below the L-shaped lower spacer that has a particular impurity concentration.

In view of the above, applicants respectfully submit that the proposed combination of the Furukawa et al., Matsuda and Lopatin et al. references fails to disclose or suggest each and every element of the rejected claims. Therefore, applicants respectfully submit that claims 20 and 26, and claims 21-25 and 27-29 depending therefrom, are allowable over the

cited prior art references. Accordingly, applicants respectfully request that this rejection be reconsidered and withdrawn.

F. New Claims

Claims 32 and 33 are added by the instant amendment. No new matter is added, and support for claims 32 and 33 can be found in the application as originally filed at, e.g., paragraph [0034] and FIGS. 5-9. Applicants respectfully request entry and examination of claims 32 and 33.

G. Conclusion

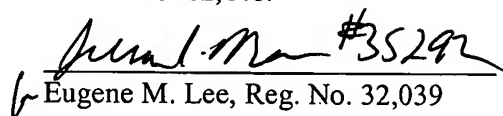
If the Examiner believes that additional discussions or information might advance the prosecution of the instant application, the Examiner is invited to contact the undersigned at the telephone number listed below to expedite resolution of any outstanding issues.

In view of the foregoing amendments and remarks, reconsideration of this application is earnestly solicited, and an early and favorable further action upon all the claims is hereby requested.

Respectfully submitted,

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PETITION and
DEPOSIT ACCOUNT CHARGE AUTHORIZATION

This document and any concurrently filed papers are believed to be timely. Should any extension of the term be required, applicant hereby petitions the Director for such extension and requests that any applicable petition fee be charged to Deposit Account No. 50-1645.

If fee payment is enclosed, this amount is believed to be correct. However, the Director is hereby authorized to charge any deficiency or credit any overpayment to Deposit Account No. 50-1645.

Any additional fee(s) necessary to effect the proper and timely filing of the accompanying-papers may also be charged to Deposit Account No. 50-1645.